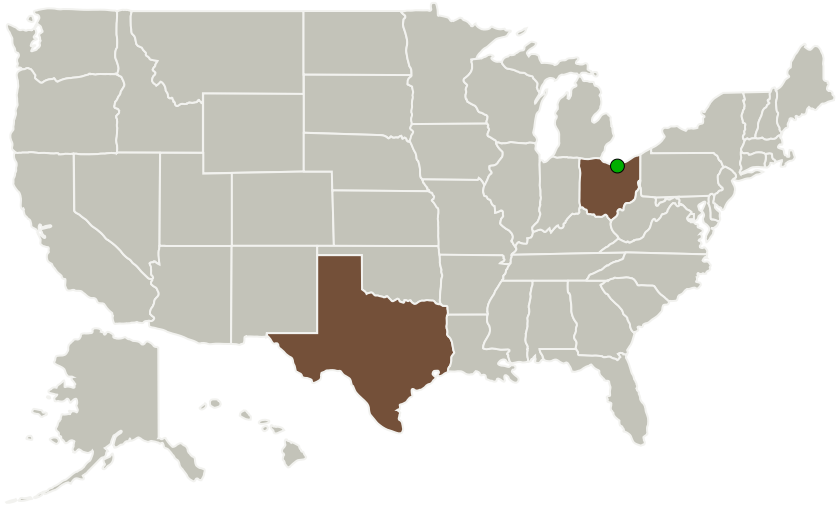
Advanced Anode Electrocatalysis Concept for Direct Methane SOFCs, Phase II

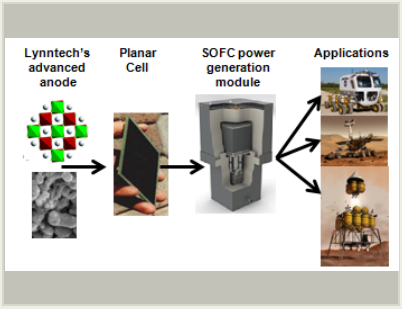
Completed Technology Project (2017 - 2019)

Project Introduction

Lunar, Mars and deep space exploration missions require enhanced mission flexibility (i.e., using whatever resources available at the destination) in order to reduce logistics burden and overall mission cost. Power generation technologies that are fuel-flexible, multi-use (e.g., Moon or Mars), and cross-platform (lander use, rover use or stationary) are critical for mission flexibility. Solid oxide fuel cell (SOFC) is the most suitable technology for electricity generation from hydrocarbons (including methane) and other fuels. State-of-the-art SOFCs are based on internal or external fuel reforming cannot function without large volumes of water (such as >300 kg of water consumption per 100 kg of methane) and have low efficiency. During the Phase I, Lynntech studied five different electrocatalysis concepts with more than 30 different electrocatalysts and identified a class of anode materials that provided direct electrochemical oxidation with high power densities using dry methane (320 mW/cm2) and humidified methane (408 mW/cm2). During Phase II, Lynntech will further optimize the anode composition and electrode structure, conduct the electrochemical characterization in single cell and short stacks, design and built a 1 kW stack with a hot box module, and show the operational performance for 500 hr using dry methane.

Primary U.S. Work Locations and Key Partners





Advanced Anode Electrocatalysis Concept for Direct Methane SOFCs, Phase II Briefing Chart Image

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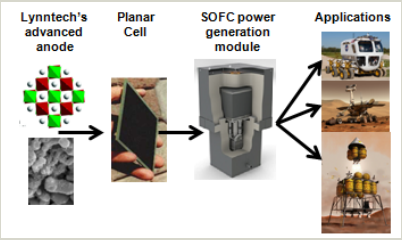
Organizations Performing Work	Role	Type	Location
Lynntech, Inc.	Lead Organization	Industry	College Station, Texas
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Texas

Images



Briefing Chart Image
Advanced Anode Electrocatalysis Concept for Direct Methane SOFCs, Phase II Briefing Chart Image *(https://techport.nasa.gov/image/129759)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Lynntech, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

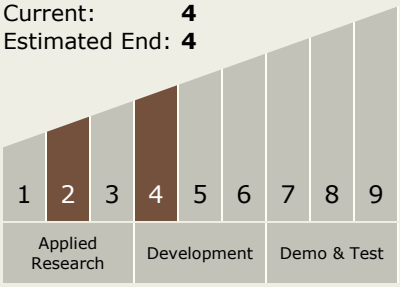
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Mahesh Waje

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.4 Dynamic Energy Conversion

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System